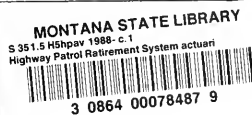


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HIGHWAY PATROL  
RETIREMENT SYSTEM

ACTUARIAL VALUATION

AS OF

JULY 1, 1988

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## SECTION I

### INTRODUCTION

An actuarial valuation of the Highway Patrol Retirement System of the State of Montana has been completed as of July 1, 1988. This valuation was authorized by the Public Employees' Retirement Board under Section 19-6-202, MCA. The purpose of the valuation was to determine the financial position of the fund, the normal cost, and the unfunded accrued liability based upon present and prospective assets and liabilities of the system as of July 1, 1988.

Section II presents an analysis of the results of the actuarial valuation. The numerical findings and membership data supporting this analysis are shown in Section III.

In conducting the actuarial valuation, certain assumptions were made as to the future experience of the system. A summary and discussion of each of the assumptions is contained in Section IV.

The valuation is based upon the Highway Patrol Retirement Act and incorporates all amendments as of July 1, 1988. A summary of the major provisions of the Act is contained in Section V.

### ACTUARIAL CERTIFICATION

The results of the actuarial valuation shown in this report are based upon information provided by the Public Employees' Retirement Division regarding plan participants, plan assets and other matters. The values have been calculated on the basis of actuarial assumptions which, in my opinion, are appropriate for purposes of this valuation.

This valuation has been prepared in accordance with generally accepted actuarial principles and practices and, to the best of my knowledge, fairly reflects the actuarial position of the Highway Patrol Retirement System as of July 1, 1988.

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Alton P. Hendrickson  
Member, American Academy  
of Actuaries

## SECTION II

### ANALYSIS OF VALUATION

#### Results of Valuation

An actuarial valuation as of July 1, 1988 has been conducted for the Highway Patrol Retirement System. This valuation has determined that the percentage of each member's salary required to fund the benefits as they accrue in the future is 21.805%. The regular contribution rate of 36.500% allows 14.695% to be applied to the unfunded past service liability. This percentage is sufficient to amortize the unfunded past service liability over a period of 36.65 years. This period has decreased from 37.29 years in 1986.

An amortization schedule has been prepared which will fund the liability as of July 1, 1984 over a remaining period of 36 years. The liability attributable to 1986 will be amortized over a remaining period of 38 years. A new liability of -\$1,804,850 was determined as of July 1, 1988. This will be amortized over a 40-year period. The total contribution rate as a percentage of salary required to meet this schedule is 36.503%. This increase from the required rate of 36.029% in 1986 is attributable to the normal cost rate increase from 21.288% to 21.805%. The schedule is illustrated on page 7.

The variations between this valuation and that of July 1, 1986 are the results of the experience of the Highway Patrol Retirement System versus the expected, as well as a change in the actuarial assumptions.

#### Actuarial Modifications

A report was prepared on noneconomic actuarial assumptions as of June 30, 1987. This report recommended changes in the mortality, disability, withdrawal and retirement rates assumptions. These assumptions were approved by the board as discussed below.

- a. **Mortality Rates.** Since 1978, the basis for mortality assumptions had been the 1971 Group Annuity Mortality Table. These rates were set back one year to reflect increased longevity. The new mortality basis is the 1983 Group Annuity Mortality Table which reflects recent experience on a national basis. This table is more conservative than the previous basis and anticipates increased longevity.

This change increased the system's liability by \$.6 million and increased the funding period by 1.6 years.

- b. **Disability.** Previous disability rate assumptions were based upon rates published by the Railroad Retirement Board in its seventh valuation of its retirement system. These rates anticipated disabilities higher than actually experienced by the Public Employees' Retirement System. The new basis is the 1983 Disability Table which anticipates fewer disabilities.

This change had a negligible effect on the system's liability.

- c. The future salary increase assumption continues at 6 1/2% per annum. No provision was made for a select rate at a lower level for the next few years. Also, the meritorious and longevity increase assumption of 3/4 of 1% has been eliminated. The net impact of this change was a decrease in the system's liability of \$1.8 million and a reduction in the funding period of 5.4 years.

The overall effect of the actuarial assumption modifications was a decrease in the system's liability of \$1.2 million and a reduction in the funding period of 3.8 years.

The experience of the Highway Patrol Retirement System has not been favorable. Active membership and annual salaries declined 7% during the biennium, while the annual benefits paid out increased 33%. If the actuarial assumptions had not been modified, the period of funding the unfunded liability would have grown from 37.29 years in 1986 to 40.45 years.

#### Summary of Data

The active membership declined from 201 members to 187 members with an annual payroll of \$5 million. There are 139 retired members, 7 disabled members and 18 individuals receiving survivor benefits. The total annual benefit payout as of July 1, 1988 was \$1.4 million. Assets increased during the biennium from \$15.9 million to \$21.2 million.

#### Conclusion

There were a large number of members who retired from the Highway Patrol without being replaced. As a result, the active membership has declined. This has caused an increase in the percentage of salary required for funding the system as reflected in the larger normal cost rate. This increase was offset by the modifications of the actuarial assumptions, and as such the system's funding position has remained relatively constant.

SECTION III  
Highway Patrol Retirement System

SCHEDULE 1  
NORMAL COST ALLOCATION

(1) Normal Cost Contribution Rate:	
(a) Retirement	18.968%
(b) Death	0.687
(c) Disability	1.642
(d) Vested	0.078
(e) Withdrawals	0.430 -----
(f) Total Rate	21.805%
(2) Present Value of Future Salaries Of Current Members	\$ 38,473,760
(4) Present Value of Future Normal Costs For Current Members (1(f) * (2))	\$ 8,389,203

Highway Patrol Retirement System

SCHEDULE 2

PRESENT VALUE OF BENEFITS

(1) Present Value of Benefits - Inactive Members

(a) Retirement	\$ 18,051,990
(b) Death	865,887
(c) Disability	726,589
(d) Vested	30,526
(e) Withdrawals	1,296
	-----
(f) Total Inactive	\$ 19,676,288

(2) Present Value of Benefits - Active Members

(a) Retirement	\$ 27,929,498
(b) Death	678,492
(c) Disability	1,574,957
(d) Vested	87,587
(e) Withdrawals	287,841
	-----
(f) Total Active	\$ 30,558,375
	-----

(3) Total Liabilities \$ 50,234,663

Highway Patrol Retirement System

SCHEDULE 3

LIABILITY ALLOCATION AND STATUTORY FUNDING

(1) Unfunded Past Service Liability

(a) Present Value of Benefits	\$ 50,234,663
(b) Present Value of Future Normal Costs	\$ 8,389,203
(c) Fund Assets	\$ 21,202,840 -----
(d) Unfunded Liability (a)-(b)-(c)	\$ 20,642,620

(2) Contribution Rates Amortized over 36.65 Years

(a) Present Value of Salaries During Next 36.65 Years	\$ 140,473,755
(b) Unfunded Contribution Rate $1(d)/2(a)$	14.695%
(c) Normal Cost Rate (Schedule 1)	21.805 -----
(d) Statutory Funding Rate	36.500%



# Highway Patrol Retirement System

## SCHEDULE 4

### UNFUNDED LIABILITY AMORTIZATION SCHEDULE

(1) 1984 Unfunded Past Service Liability Account		
(a)	1984 Liability Account as of 7/1/86	\$ 11,380,972
(b)	Interest Charge on Liability Account	1,893,793
(c)	Contributions during Biennium	
	Allocated to Unfunded Liability	976,109
(d)	Interest Credit on Contributions	75,278
		-----
(e)	1984 Liability Account as of 7/1/88	\$ 12,223,378
(2) 1986 Unfunded Past Service Liability Account		
(a)	1986 Liability Account as of 7/1/86	\$ 9,519,480
(b)	Interest Charge on Liability Account	1,584,041
(c)	Contributions during Biennium	
	Allocated to Unfunded Liability	816,463
(d)	Interest Credit on Contributions	62,966
		-----
(e)	1986 Liability Account as of 7/1/88	\$ 10,224,092
(3) Actuarial Gain/Loss		
(a)	Actual Unfunded Liability (Schedule 3)	\$ 20,642,620
(b)	1984 Liability Account as of 7/1/88	12,223,378
(c)	1986 Liability Account as of 7/1/88	10,224,092
		-----
(d)	1988 Liability Account as of 7/1/88	\$ -1,804,850
(4) Required Contribution Rate		
(a)	Normal Cost Rate (Schedule 1)	21.805%
(b)	Rate to Fund 1984 Liability Account	
	Over 36-Year Period	8.821
(c)	Rate to Fund 1986 Liability Account	
	Over 38-Year Period	7.080
(d)	Rate to Fund 1988 Liability Account	
	Over 40-Year Period	-1.203
		-----
(e)	Total Contribution Rate	36.503%

Highway Patrol Retirement System

SCHEDULE 5

COMPARISON OF VALUATIONS

	<u>1986</u>	<u>1988</u>
Liability for Future Service	\$ 8,149,317	\$ 8,389,203
Unfunded Liability	\$20,900,452	\$20,642,620
Years Required to Pay Off Unfunded Liability	37.29	36.65
Assets	\$15,865,541	\$21,202,840
Normal Cost Rate	21.29%	21.81%
Unfunded Liability Rate	15.21%	14.70%
Total Recommended Rate	36.50%	36.50%
Annual Payroll	\$ 5,274,317	\$ 4,902,103
Annual Benefits	\$ 1,065,064	\$ 1,412,664
Number of Active Members	201	187
Number of Retired Members	120	139
Number of Disabled Members	6	7
Number of Survivor Benefits	19	18
Number of Vested Deferred	1	1

# SCHEDULE 6

## TABLE 1

### Highway Patrol Retirement System

#### Number of Active Members

Completed Years of Service	Under 25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	OVER 65	Total
0-4	3	12	13	6							34
5-9			8	9	5			1			23
10-14			2	17	23	2					44
15-19				3	18	11	3				35
20-24					3	31	4				38
25-29							6	1	1		8
30-34							1	3			4
35-39											
40-UP									1		1
TOTAL	3	12	23	35	49	44	14	5	2		187

TABLE 2  
Highway Patrol Retirement System  
Average Salaries of Active Members

Completed Years of Service	Under 25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	OVER 65	Total
0-4	20189	20851	20858	20986							20819
5-9			23612	23882	22880			45341			24503
10-14			25546	27166	26834	27308					26925
15-19				26494	27696	28034	27593				27691
20-24					27509	28400	29233				28417
25-29							29754	29648	29829		29750
30-34							28624	33937			32609
35-39											
40-UP									28500		28500
TOTAL	20189	20851	22224	25204	26789	28259	29061	35360	29165		26214

TABLE 3  
Highway Patrol Retirement System  
Annual Salaries of Active Members  
In Thousands

Completed Years of Service	Under 25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	OVER 65	Total
0-4	61	250	271	126							708
5-9			189	215	114			45			563
10-14			51	462	617	55					1185
15-19				79	499	308	83				969
20-24					83	880	117				1080
25-29							179	30	30		239
30-34							29	102			131
35-39											
40-UP									29		29
TOTAL	61	250	511	882	1313	1243	408	177	59		4904

TABLE 4  
Highway Patrol Retirement System  
Number of Vested Inactive Members

Completed Years of Service	Under 25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	OVER 65	Total
0-4											
5-9								1			1
10-14											
15-19											
20-24											
25-29											
30-34											
35-39											
40-UP											
TOTAL								1			1

TABLE 5  
Highway Patrol Retirement System  
Summary of Retirees

Number of Members								
Age Group								
Under 55	55-59	60-64	65-69	70-74	75-79	80-84	Over 84	Total
38	37	17	14	8	14	10	1	139

Total Monthly Benefit								
Age Group								
Under 55	55-59	60-64	65-69	70-74	75-79	80-84	Over 84	Total
32524	31849	16050	8960	4147	6850	5187	373	105941

Average Monthly Benefit								
Age Group								
Under 55	55-59	60-64	65-69	70-74	75-79	80-84	Over 84	Total
856	861	944	640	518	489	519	373	762

TABLE 6  
Highway Patrol Retirement System  
Summary of Disabled

Number of Members								
Age Group								
Under 55	55-59	60-64	65-69	70-74	75-79	80-84	Over 84	Total
3	3	0	0	0	0	0	1	7

Total Monthly Benefit								
Age Group								
Under 55	55-59	60-64	65-69	70-74	75-79	80-84	Over 84	Total
2215	1519	0	0	0	0	0	347	4081

Average Monthly Benefit								
Age Group								
Under 55	55-59	60-64	65-69	70-74	75-79	80-84	Over 84	Total
738	506	0	0	0	0	0	347	583



TABLE 7  
Highway Patrol Retirement System  
Summary of Survivors

Number of Members								
Age Group								
Under 55	55-59	60-64	65-69	70-74	75-79	80-84	Over 84	Total
3	1	2	2	1	3	3	3	18

Total Monthly Benefit								
Age Group								
Under 55	55-59	60-64	65-69	70-74	75-79	80-84	Over 84	Total
699	809	740	979	528	1464	1159	1321	7700

Average Monthly Benefit								
Age Group								
Under 55	55-59	60-64	65-69	70-74	75-79	80-84	Over 84	Total
233	809	370	490	528	488	386	440	428

## SECTION IV

### ACTUARIAL FUNDING METHOD AND ASSUMPTIONS

The true cost of the Highway Patrol Retirement System will be determined by its future experience. In determining the financial requirement of the fund, certain assumptions were made as to the expected future experience. This section summarizes the funding method applied as well as the basic assumptions used.

Any variations in the actual experience of the fund from those assumed in this valuation may cause changes in the projected future costs of the fund. It is therefore necessary that the actuarial assumptions be reviewed from time to time with adjustments as experience warrants. It is also important that regular valuations be performed to determine the financial effect of variations between the actual and assumed experience.

The assumptions shown below were based upon the past experience of the fund together with the projections as to future experience.

#### Funding Method

The method of funding employed is commonly referred to as the entry age normal cost method. This method establishes a normal cost of each fund as well as an unfunded accrued liability. The normal cost is the level percentage of total salaries required to fund the benefits, assuming this percentage has been contributed since each member's entry into the fund.

The unfunded accrued liability represents the excess of the present value of total liabilities over the present assets of the fund and the present value of expected future contributions for the normal cost.

In order to maintain the fund on an actuarially sound basis, the rate of contribution should be such as to meet the normal cost in addition to making progress towards the amortization of the unfunded liability.

## DISCUSSION OF ACTUARIAL ASSUMPTIONS

### Mortality Rates

The mortality rates for males and females are based upon the 1983 Group Annuity Mortality Table, and apply to both active members and those receiving benefits. These rates have longer life expectancies than the 1971 Group Annuity Table used in the previous valuation.

### Disability Rates

The disability rates for males and females are based upon the 1983 Disability Table and anticipate fewer disabilities than the previous rates as published by the Railroad Retirement Board.

### Withdrawal Rates

The withdrawal rates are based upon the actual experience of the system as determined in the 1987 withdrawal experience study.

### Salary Scale

The rates of salary increase are based upon an assumed compounded growth rate of 6.5% per annum.

### Investment Earnings

It was assumed that the investment earnings would be 8% compounded annually.

### Administrative Expenses

It was assumed that the system would incur no administrative expenses beyond those provided by investment earnings in excess of 8%.

### Termination Benefits

It was assumed that all members terminating with less than ten years of service would receive an immediate withdrawal of their member contributions with interest. It was further assumed that members with ten or more years of service would select the most advantageous benefits under the given assumptions.

### Withdrawal Rates

The withdrawal rates illustrated below reflect the turnover experienced by the Highway Patrol Retirement System.

<u>Age</u>	<u>Withdrawals Per 10,000 Active Members</u>
25	592
30	336
35	211
40	195
45	104
50	0

### Salary Scale

The salary increases are based upon an assumed compounded growth rate of 6.5% per annum.

### Investment Earnings

Future investment earnings are assumed to be 8% compounded annually.

### Administrative Expenses

It was assumed that the administrative expenses would be recovered by investment earnings in excess of 8%.

SECTION V

SUMMARY OF BENEFITS AND CONTRIBUTIONS

Effective Date - July 1, 1945

Member Contributions - 7.59% of salary.

State Contributions - 1/3 of all driver's license fees to provide at least 26.75% of active patrolmen's salaries.

Retirement Benefit - Minimum service: 20 years  
Minimum age:

- a) if first employed on or before July 1, 1985, none
- b) if first employed after July 1, 1985, age 50.

Normal form: Life payments to the member and, upon the member's death, continuing to the surviving spouse. In the event there is no surviving spouse, or the spouse subsequently dies or remarries, payments continue to dependent children, if any.

Benefit: 2% of the average monthly salary during the highest 36 consecutive months of earnings times years of service.

Disability Benefit - Service disability: 50% of the average monthly salary during the highest 36 consecutive months of earnings.

Nonservice disability: Actuarial equivalent of the accrued retirement benefit.

Death Benefit - Service death: 50% of the average monthly salary during the highest 36 consecutive months of earnings less any amounts payable under the Workers' Compensation Act.

Nonservice death: Actuarial equivalent of the accrued retirement benefit based upon a retirement age of 60.

Termination Benefit -

Prior to completion of 5 years of service, return of accumulated contributions without interest if involuntary or with interest if voluntary. After completion of 5 years of service, either return of accumulated contributions with interest or the actuarial equivalent of the accrued retirement benefit based upon a retirement age of 60.

Benefit Adjustments -

Subject to certain limitations, retired members and their beneficiaries are entitled to benefits not less than 2% multiplied by the member's years of service multiplied by the current base salary received by a probationary highway patrolman.